United States of America

Preliminary Draft WRC-2000 Proposal

EPFD LIMITS TO PROTECT 1.8 AND 2.4 M BSS ANTENNAS IN THE 12.2-12.7 GHZ BAND (WRC-2000 agenda item 1.13)

1.0 Introduction

In the two years since WRC-97, ITU-R Joint Working Party 10-11S ("JWP 10-11S") and the Joint Task Group 4-9-11 ("JTG 4-9-11") have worked tirelessly to review and revise the WRC-97 provisional equivalent power flux density ("$EPFD_{down}$") limits for non-geostationary orbit fixed-satellite service ("NGSO FSS") systems sharing with broadcasting-satellite service ("BSS") in the 12.2-12.7 GHz band in Region 2. As a result of this intense work, the ITU-R had adopted a Draft New Recommendation ("DNR") containing the agreed criteria to use in developing the efpd limits to protect BSS systems. The DNR specifies two criteria—1) a limit on the allowed increase in unavailability in a BSS system from the aggregate interference from NGSO FSS systems; and 2) a requirement that the interference from NGSO FSS into a BSS system never lead to a loss of video picture continuity under clear-sky conditions. Using this criteria, the ITU-R has been able to reach agreement on $EPFD_{down}$ limts on NGSO FSS to protect BSS receive earth station antennas with diameters of 30 cm, 45 cm, 60 cm, 90 cm and 120 cm. However, the ITU-R has analyzed and discussed the limits necessary to protect BSS receive earth station antennas with diameters of 180 cm and 240 cm, but has not been able to reach agreement.

This document provides the preliminary draft proposal of the United States of America regarding $EPFD_{down}$ limits for NGSO FSS to protect 180 cm and 240 cm BSS antennas. At the same time, we note that the Federal Communications Commission within the U.S. has an ongoing process addressing domestic service rules and licensing issues for NGSO FSS systems. CITEL administrations may wish to consider this proposal as a basis for common CITEL views and/or proposals.

2.0 Discussion

The U.S. has closely followed the work of JWP 10-11S and JTG 4-9-11 in this area. After careful assessment of the JTG 4-9-11 output, and in order to accommodate NGSO FSS, the U.S. has re-evaluated the limits necessary to protect its 180 and 240 cm BSS antennas. The proposals contained in this paper represent the $EPFD_{down}$ limits necessary to protect BSS to Alaska and Hawaii. These proposals are significantly relaxed from the U.S. input document to the May 1999 JWP 10-11S/JTG 4-9-11 meetings, in order to balance the necessity to protect existing services, while accommodating NGSO FSS in this band.

U.S. BSS systems must use larger dishes to serve Alaska and Hawaii for a variety of technical reasons. Due to a stringent pfd limit on Region 2 BSS to protect terrestrial services in Region 1, any BSS system serving Alaska must use receive earth station antennas on the order of 180 cm to 240 cm. In addition, the existing and planned U.S. BSS systems must use antennas as large as 180 cm in Hawaii.

Our proposal is based upon the work performed by JWP 10-11S and JTG 4-9-11, which identified the need for more stringent $EPFD_{down}$ limits for latitudes greater than 57.5°. The proposal also contains the BSS reference earth station antenna patterns developed by the ITU-R (Draft New Recommendation ITU-R BO.[Doc. 11/137 Annex 1) for use in the $EPFD_{down}$ equation. These antenna patterns are more stringent that the antenna patterns provided in Appendix **S30** of the Radio Regulations, thus effectively relaxing the $EPFD_{down}$ limits for NGSO FSS systems. Document 4-9-11/245 demonstrates that F-SATMULTI-1B satellites whose sub-satellite point is above 40 N.L. will have a much lower pfd, on the order of –177 dBW/m2/4 kHz, versus satellites whose sub-satellite point is below 40 N.L. In addition, the inclination of the F-SATMULTI-1B system results in many of these lower pfd satellites available at latitudes greater than 40 N.L. to serve high latitude locations such as Alaska. In addition, the isolated geographical location of Hawaii will facilitate the ability of NGSO FSS systems to meet the proposed $EPFD_{down}$ limits in this limited geographical area. Therefore, our proposal should not be problematic.

3.0 $EPFD_{down}$ limits for 1.8 m and 2.4 m BSS receive earth stations

The Tables in the Annex provide both the aggregate and single entry limits to protect 180 cm and 240 cm diameter BSS receive earth station antennas. Tables 1 and 2 provide the aggregate and single entry limits, respectively, for 180 cm and 240 cm BSS antennas at latitudes below 57.5°, including an $EPFD_{down}$ limit to protect BSS in Region 2 west of 150° West Longitude. Table 3 provides the latitude dependent curve for the $EPFD_{down}$ limit never to be exceeded.

4.0 Conclusions

The U.S. has followed closely the work of the ITU-R in regards to the protection of BSS from NGSO FSS. After carefully assessing the output from the JTG 4-9-11, and in order to accommodate NGSO FSS, the U.S. has re-evaluated the limits necessary to protect its 180 and 240 cm BSS antennas. The preliminary draft proposals contained in this paper, which are significantly relaxed from the U.S. input document to the May JWP 10-11S/JTG 4-9-11 meeting(s), represent the $EPFD_{down}$ limits necessary to protect BSS to Alaska and Hawaii.

ANNEX

Table 1. Limits to the aggregate EPFD $_{down}$ radiated by non-GSO FSS systems in certain frequency bands at latitudes ≤ 57.5 °

180cm and 240cm BSS antennas

Frequency Band (GHz)	Epfd$_{down}$ [1] dB(W/m^2)	Percentage of time during which EPFD$_{down}$ level may not be exceeded	Reference Bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern[2]
12.2 – 12.7 GHz in Region 2	-179.50	0.00	40 kHz	180 cm DNR ITU-R BO.[Doc. 11/137 Annex 1]
	-178.66	33.00		
	-176.25	98.50		
	-163.25	99.81		
	-161.50	99.91		
	-160.35	99.98		
	-160.00	99.99		
	-159.90	100.00		
12.2 – 12.7 GHz in Region 2	-182.00	0.00	40 kHz	240 cm DNR ITU-R BO.[Doc. 11/137 Annex 1]
	-180.90	33.00		
	-178.00	99.25		
	-164.40	99.85		
	-161.90	99.94		
	-160.50	99.98		
	-160.00	99.995		
	-159.90	100.00		

[1] In Region 2 west of 150° West Longitude, –163 dBW/m2/40 kHz may not be exceeded for 100% of the time.

[2] Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

Table 2. Limits to the $EPFD_{down}$ radiated by non-GSO FSS systems at latitudes ≤ 57.5 ° in certain frequency bands

180cm and 240cm BSS antennas

Frequency Band (GHz)	$EPFD_{down}$ [1] [2] dB(W/m^2)	Percentage of time during which $EPFD_{down}$ level may not be exceeded	Reference Bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern [3]
12.2 – 12.7 GHz in Region 2	-184.94	0.00	40 kHz	180 cm DNR ITU-R BO.[Doc. 11/137 Annex 1]
	-184.10	33.00		
	-181.69	98.50		
	-176.25	99.57		
	-163.25	99.95		
	-161.50	99.98		
	-160.35	99.99		
	-160.00	99.999		
	-159.90	100.00		
12.2 – 12.7 GHz in Region 2	-187.44	0.00	40 kHz	240 cm DNR ITU-R BO.[Doc. 11/137 Annex 1]
	-186.34	33.00		
	-183.44	99.25		
	-178.00	99.79		
	-164.00	99.96		
	-161.90	99.98		
	-160.50	99.99		
	-160.00	99.999		
	-159.90	100.00		

[1] In Region 2 west of 150° West Longitude, –163 dBW/m2/40 kHz may not be exceeded for 100% of the time.

[2] For checking compliance with these limits, the BR software will use increments of 0.1 dB and will test against the fractionally more severe value: for example where the $EPFD_{down}$ limit is -165.841 dB(W/m^2/40 kHz) the software will test against a criterion of -165.9 dB(W/m^2/40 kHz).

[3] Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

Table 3. 100% of the time single-entry and aggregate $EPFD_{down}$ value varying with latitude for BSS earth station antennas larger than 120 cm.

100% of the time $EPFD_{down}$, dB(W/m2/40kHz)	**Latitude, North or South, degrees**
-160	0 ≤ LATITUDE ≤ 57.5
-160 + 15*(57.5-LATITUDE)/7	57.5 ≤ LATITUDE ≤ 61
-167.5	61 ≤ LATITUDE

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